

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
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L4	821	(715/764).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/01/07 18:29
L5	935	(715/501.1).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/01/07 18:29
L6	4672	(707/3).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/01/07 18:30
L7	1678	(707/4).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/01/07 18:30
L8	4370	(707/10).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/01/07 18:30
L9	3711	(707/104.1).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/01/07 18:30
L10	1727	object with model with relationship	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/01/07 18:31

L11	37207	select\$4 near8 relationship	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/01/07 18:32
L12	65	10 same 11	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/01/07 18:32
L13	17	12 and browser	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/01/07 18:32



US006775674B1

(12) **United States Patent**
Agassi et al.

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(45) Date of Patent: **Aug. 10, 2004**

(54) **AUTO COMPLETION OF RELATIONSHIPS
 BETWEEN OBJECTS IN A DATA MODEL**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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Related U.S. Application Data

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(51) Int. Cl.⁷ **G06F 17/00**

(52) U.S. Cl. **707/100; 707/1; 707/2**

(58) Field of Search **707/1-10, 100-104.1, 707/509**

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,548,749 A * 8/1996 Kroenke et al. 395/600
 5,553,218 A * 9/1996 Li et al. 395/148
 5,659,723 A * 8/1997 Dimitrios et al. 395/614
 5,758,335 A * 5/1998 Gray 707/101
 5,774,128 A * 6/1998 Golshani et al. 345/440

5,848,424 A * 12/1998 Scheinkman et al. 707/501
 5,884,311 A * 3/1999 Blattmann-Bleile et al. .. 707/10
 6,014,670 A 1/2000 Zamanian et al.
 6,052,687 A * 4/2000 Miura et al. 707/100
 6,128,621 A 10/2000 Weisz
 6,202,099 B1 3/2001 Gillies et al.
 6,233,578 B1 5/2001 Machihara et al.

OTHER PUBLICATIONS

IBM TDB (Automatic Query Generation, IBM Technical Disclosure Bulletin, Apr. 1991, vol. 33, No. 11, pp. 439-440).*

* cited by examiner

Primary Examiner—Jean M. Corrielus

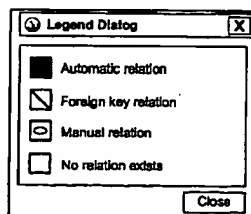
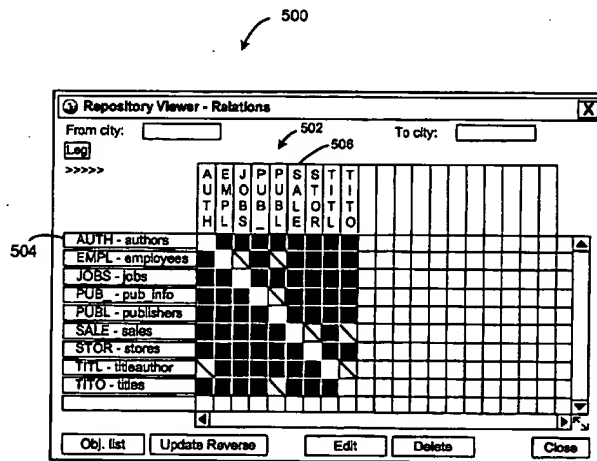
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(57) **ABSTRACT**

In a computer system including a database system wherein queries to the database system can be specified by selecting a first object and a second object, with a query result being based on a relationship between the first object's metadata and the second object's metadata, relationships are generated by automatically populating a relationship matrix having undefined relation cells therein from pre-defined relationships represented by defined relation cells in the relationship matrix and transitively completing a local set of relationships defined in the relationship matrix.

8 Claims, 7 Drawing Sheets





US006701321B1

(12) **United States Patent**
Tsai(10) Patent No.: **US 6,701,321 B1**(45) Date of Patent: ***Mar. 2, 2004**(54) **METHOD AND APPARATUS FOR
NAVIGATION OF RELATIONAL DATABASES
ON DISTRIBUTED NETWORKS**5,895,468 A * 4/1999 Whitmyer, Jr. 707/10
5,913,210 A * 6/1999 Call 707/4
5,913,214 A * 6/1999 Madnick et al. 707/10(76) Inventor: **Daniel E. Tsai**, 39 Bayberry Dr.,
Atkinson, NH (US) 03811(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.This patent is subject to a terminal dis-
claimer.**OTHER PUBLICATIONS**"Object-Oriented Analysis and Design with Applications",
G. Booch, Benjamin/Cummings Publishing Co., 1994, pp.
155, 156, 179-183."The Logic of Architecture", W.J. Mitchell, Massachusetts
Institute of Technology, 1990, p. 139."Strategic Database Technology: Management for the year
2000", A.R. Simon, Morgan Kaufmann Publishers, 1995,
pp. 6-9, 14-17, 55-57.

(List continued on next page.)

(21) Appl. No.: **09/524,108**(22) Filed: **Mar. 13, 2000****Related U.S. Application Data**(63) Continuation of application No. 08/982,467, filed on Dec. 2,
1997, now Pat. No. 6,038,566.(60) Provisional application No. 60/032,773, filed on Dec. 4,
1996.(51) Int. Cl.⁷ **G06F 17/30**(52) U.S. Cl. **707/102; 707/3; 707/4;**
707/103 R; 707/10; 709/201; 709/229;
709/219(58) Field of Search **707/102, 3, 4,**
707/10, 103 R; 709/201, 203, 219, 229(56) **References Cited****U.S. PATENT DOCUMENTS**5,355,472 A * 10/1994 Lewis 707/101
5,634,121 A * 5/1997 Tracz et al. 707/2
5,678,041 A * 10/1997 Baker et al. 707/9
5,761,663 A * 6/1998 Lagarde et al. 707/10
5,778,367 A * 7/1998 Wesinger, Jr. et al. 707/10
5,781,739 A * 7/1998 Bach et al. 709/227
5,826,258 A * 10/1998 Gupta et al. 707/4
5,878,417 A * 3/1999 Baldwin et al. 707/10
5,878,418 A * 3/1999 Polcyn et al. 707/10*Primary Examiner*—Jean R. Homere(74) *Attorney, Agent, or Firm*—Fish & Richardson P.C.

(57)

ABSTRACTRelational databases are browsed in a manner that mirrors
the interactive browsing of world wide web pages. A
schema-based navigational layer is used on top of conven-
tional physical, logical and conceptual database schema
layers, to dynamically map data stored in a relational data-
base onto web pages. The navigational schema or schema
base is an independent abstraction from the underlying
conceptual database schema. The schema base is con-
structed from relationships and information models. The
schema base can be reused or derived from the database
design process or produced specifically for navigation
through the database. An object-role schema base is used to
demonstrate the traversal of relational information in a
regenerative, propagative manner. Navigating a database via
the presented-schema extends the conventional database
concept of the logical view to an interactive model of logical
view-transitions. The technique is a simple and powerful
model for automated access to relational databases making
available vast amounts of data stored in relational databases
for Internet and intranet web browsing.**8 Claims, 16 Drawing Sheets**